Hubble's deep field images finds distant galaxies

Astronomers analyzing the Hubble Deep Field—the faintest view of the universe taken with NASA's Hubble Space Telescope—have identified what may prove to be the most distant objects observed to date.

Scattered among the nearly 2,000 galaxies in the Hubble images, that were taken last December, researchers and collaborators found several dozen galaxies they believe exhibit characteristics which make them appear to be more distant than any seen previously. Six of the galaxies appear to be more distant than the farthest quasars, the current distance record holders.

The candidate galaxies are so far away they may have existed when the universe was less than five percent its present age. If this early galaxy population can be confirmed through further observations, it means that such galaxies would have formed remarkably early in the history of the universe, only a few hundred million years after the Big Bang. The images also give an estimate of how many galaxies were forming at this time in the very early universe.

In one of the first studies of the statistical properties of these distant galaxies, Kenneth Lanzetta and Amos Yahil, of State University of New York and Alberto Fernandez-Soto, of the University of Cantabria in Spain, have attempted to determine the distance of the galaxies based on their colors.

''Since light travels at a finite speed, the galaxies are seen as they were in the distant past, allowing us to study the birth and growth of galaxies versus time,'' said Lanzetta. ''Our results have implications bearing not only on the formation and evolution of galaxies but also on the ultimate fate of the universe,'' adds Yahil.

The team's distance estimates rely on the relationship between speed and distance in the expanding universe. The expansion of the universe causes the light from distant galaxies to be ''redshifted." This means that light which leaves a distant galaxy as blue arrives at Hubble as red because of the expansion of space. For a nearby galaxy the shift from blue to red is relatively small, but for a distant galaxy the shift is dramatic, because the light is crossing a larger volume of space.

The researchers took the colors of different kinds of nearby galaxies and redshifted them on a computer to compare with the colors of galaxies observed by Hubble. For each galaxy they assigned a ''most probable'' redshift based on the best match to the ''spectral templates'' they developed.

While the procedure is not definitive for any individual galaxy, the authors contend that it is correct for the majority of galaxies and gives a good overall view of the distribution of distances of the galaxies seen in the Hubble image. If the redshifts are correct, then the light from these galaxies was emitted when the universe was far less than one billion years old.

Hubble spent ten days in December 1995 observing a single tiny patch of sky. These observations resulted in the deepest image of the sky, revealing galaxies fainter than had ever been seen before. The striking full-color image of the distant universe was unveiled at the American Astronomical Society Meeting in January 1996, and for the last six months has been the subject of intense study worldwide.

Langley boss to retire soon

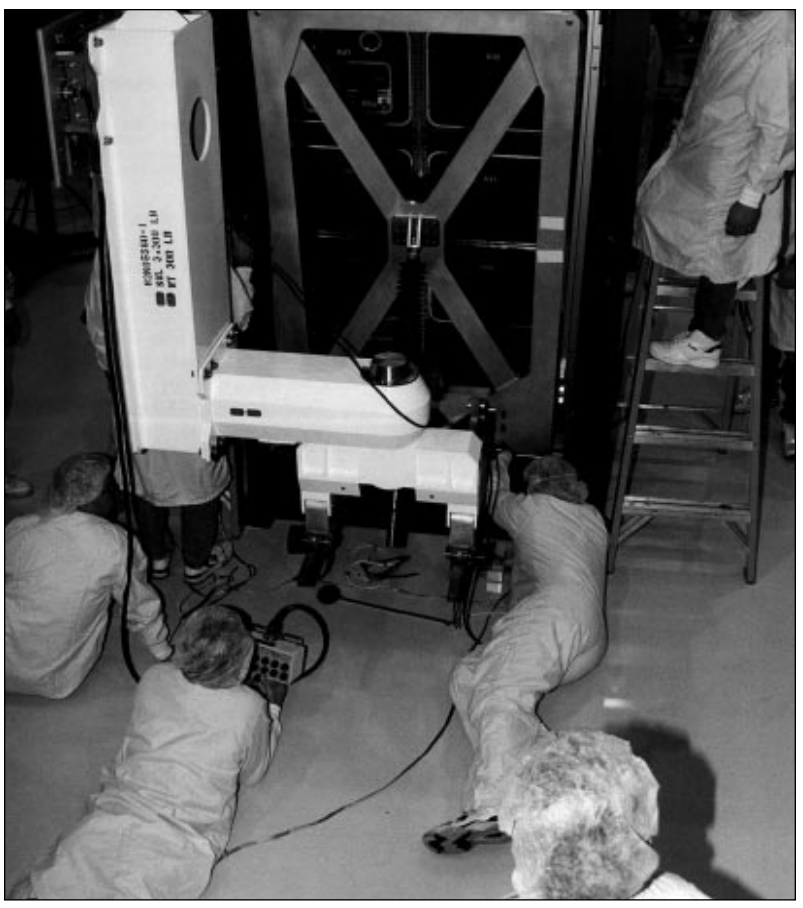
Paul Holloway has announced he is stepping down as director of NASA's Langley Research Center no later than early October 1996.

Holloway said he is leaving to allow the appointment of a director who could make a longer-term commitment to steering Langley through the challenges facing the agency for the rest of the decade.

"This is the lull before the November election, and after that Langley is going to need the services of a center director who is willing to stick around for a while," said Holloway, a Langley employee since June 1960. "Everyone knows I have been considering leaving within the next two or three years, and this is a good time to do it."

"Paul Holloway will be missed," said NASA Administrator Daniel S. Goldin. "His career spans almost the entire history of the space age, and his many achievements at Langley are a tribute to his talent, his professionalism and his dedication to the importance of NASA aeronautical programs. We wish him all the best in the future."

Holloway said stepping down is not easy. "This has been my life for so many years, and I have made many friends. But I am confident that the wonderful people of Langley will carry on the reputation of this center as a world-class facility."



In the Space Station Processing Facility at Kennedy Space Center, engineers install an experiment rack in a specially designed Spacehab adapter. The Active Rack Isolation System Experiment is designed to dampen vibration disturbances that could interfere with microgravity experiments in the Spacehab module on STS-79. The ARIS rack will provide a microgravity research environment free from the disturbances typically created by spacecraft hardware. The Spacehab will be installed into *Atlantis*' payload bay at Launch Pad 39A Tuesday.

JSC employees, contractors to be honored next week

NASA astronauts are among the employees who will receive the agency's highest honors in a ceremony to be held at 3 p.m. Tuesday in the Teague Auditorium.

This year's ceremony will honor individuals and groups nominated by center management and selected by the Incentive Awards Board at NASA Headquarters to receive NASA's highest honorary awards.

Each recipient of a NASA medal will also be presented with a framed certificate signed by NASA Administrator Daniel S. Goldin. Individuals selected to receive Group Achievement Awards on their team's behalf will receive a framed certificate. Certificates for individual participants of teams will be forwarded to the nominating organizations at a later date. NASA's Deputy Director John Dailey and JSC's Deputy Administrator James Wetherbee, will assist JSC Director George Abbey in presenting the awards.

Following the ceremony, a reception will be held in the lobby of the auditorium for award recipients and their guests. Supervisors are encouraged to allow employees to attend as their workloads permit. For details about the ceremony, contact Helen Harris at x38413.

EAA hosts variety dinner dance

The Employee Activities Association will host a Variety Dinner and Dance at 7:30 p.m. July 13 in the Gilruth Center.

The dance will feature the Aubrey Tucker Orchestra in the ballroom and the Southern Cross band in the gym. Tickets are on sale through Wednesday and cost $22 per person including dinner and beverage coupons. Dinner includes chopped sirloin, carrots, new potatoes, salad and dessert. For more information call Mavis Ilkenhans at x49644.

JSC takes home bronze

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"On the Cutting Edge: ISS" won in the Television or Cable Program for Children category. This live educational teleconference from the Bldg. 9A space station mock-up was jointly developed by Oklahoma State University "Teaching from Space" educational producer Camille Moody and Taft producers Pat Lowry and Florence Newman. The program featured live interaction between several astronauts and students in the facility as well as students participating remotely via computer hookups and telephone call-ins. During the event, students learned about the International Space Station and the mission it will perform over the coming years. Taft carried out the monumental logistical task of staging and broadcasting the event which was carried live, on the NASA Television satellite, to schools across the country and on NASA Television.

The Media Services Corp. received two Bronze Telly Awards for productions created for the Office of Public Affairs. The award winning productions are, "1995 Mission Highlights," a five minute music video produced by Denise Dicks and Glen Peterson showcasing the shuttle missions flown in 1995, and "The First Step," an eight and a half minute narrated piece produced by Craig Crowe and written by Denise Dicks recapping the successes of the International Space Station's phase one missions, beginning with STS-60 and ending with STS-76.

Crew repairs bubble drop unit

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the Earth smaller for all its inhabitants is the Olympics. We are honored on this mission to be flying a banner celebrating the 1996 Olympics in Atlanta."

Both Mir and *Columbia* were greeted by the executive director of the 1996 Olympics Bill Payne.

"We are very proud that you have taken our Olympic torch into space with you traveling some five and a half million miles," Payne said. "When you return to Cape Canaveral, that will be the day the Olympic torch relay reaches Cape Canaveral. We will have the great honor of joining the torch you carry with you on this mission with the Olympic flame and recording for all history the fact that this torch relay demonstrated cooperation among so many countries of the world."

Meanwhile, investigations continue with the crew adjusting its sleep schedule to accommodate an early wake up call on landing day and to investigate circadian rhythms and the crew's duty performance.

"We are sleep shifting 25 minutes earlier each day," Henricks said in an interview Tuesday. "Those minor changes in our wake-up time should not affect performance and that is what we are measuring. Once we return to Earth we can see if we are successful in controlling circadian rhythms even though we are not exposed to a typical day night cycle. It will be very beneficial to folks that work changing shifts on Earth."

The crew completed the last in a series of Torso Rotation Experiments on Monday. Linnehan and Thirsk wore torso and head sensors that measure eye, head and body coordination. Researchers will analyze this test with others taken earlier to determine the effects of long duration weightlessness.

Muscle strength measurement experiments continue on the Torque Velocity Dynamometer. "With this information we can figure better ways to keep people in space healthier and fight off muscle and bone degeneration," Linnehan said.

Other experiments are going well as the crew repaired the Bubble Drop and Particle Unit last week. Power was rerouted to one of the test containers, bypassing a circuit which had been causing an intermittent short. On Monday, Favier and Brady melted a solid tetracosane sample to study the separation process and help prevent flaws in glass and crystal as they solidify. Over the weekend, Kregel praised a video-conferencing system being tested on *Columbia*. "The video conferencing has really been outstanding," Kregel said. "We used it to fix the Bubble, Drop and Particle Unit experiment, and it made fixes a lot easier."

Discovery returns to Florida

(Continued from Page 1)

Monday, and the Spacehab double module will be installed in the payload bay Tuesday.

Readdy, Blaha, Pilot Terry Wilcutt, and Mission Specialists Tom Akers, Jay Apt and Carl Walz, will participate in a final countdown rehearsal July 18 and 19, as the payload bay doors are closed for flight.

Meanwhile, *Discovery* completed its ferry flight from California to Florida this week following maintenance and refurbishing at Rockwell International's factory in Palmdale, Calif. As part of that work, equipment necessary for Mir dockings was installed in the orbiter.

However, *Discovery*'s first flight upon returning to the fleet will be the second Hubble Space Telescope Servicing mission, scheduled for launch Feb. 13, 1997.

Removal of the ferry tail cone and initial power-up in the Orbiter Processing Facility are scheduled for Tuesday. *Discovery*'s payload bay doors will be opened July 16.

With *Discovery* back in the launch rotation, *Endeavour* begins eight months of major modifications and structural inspections at Palmdale. Delivery to California is planned for the first week of August. Once *Endeavour* returns to KSC, its next mission will be the first International Space Station assembly shuttle flight, in late 1997.

Space News Roundup

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Students talk to Lucid on Mir

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CNN and CompuServe, Lucid answered questions ranging from the taste of food to the best way to get into the space program.

Food on board Mir was of interest for many of the students who asked questions like "How does the food taste?" and "What happens if you run out of food?" But Lucid assured them that food was not an issue.

"The food tastes really good. We have been up here for over three months and the food still tastes very good. We have a mixture of both Russian and American food on board. I don't think we're going to run out of food either. There's a lot here and, every six to eight weeks, a spacecraft brings us more food. The next shuttle will also bring food up. Eating is one of the things we really enjoy doing up here."

Other students wanted to know what Lucid thought was the best way to get in the space program, being in the military or being a scientist. "Either way," Lucid said. "The American space program is equally split. I have no military experience at all. The key is to do what you really enjoy doing. If you like the military, that's the way to go. But either way is a good way to get into the program."

In addition to these interviews, Lucid and her crewmates continued with their work aboard the space station this week, working with an experiment similar to the work being done on *Columbia*.

The Candle Flame in Microgravity experiment focuses on studies of a candle flame in a weightless environment to try and gain additional insight into the complicated physio-chemical process of combustion. Continuing Earth observations focused on the Texas/ Louisiana coast, Mexico City and the North East U.S. Urban Region.

Cosmonaut Researcher John Blaha finished his training activities in Star City and returned home this week after participating in a pre-flight press conference in Star City last Wednesday. He took the remainder of this week off, and will begin final preparations for his launch on STS-79 Monday. Blaha will replace Lucid on Mir in early August.

NASA-JSC